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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Personal Hygiene and Tooth Brush

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(57) 6 Claims

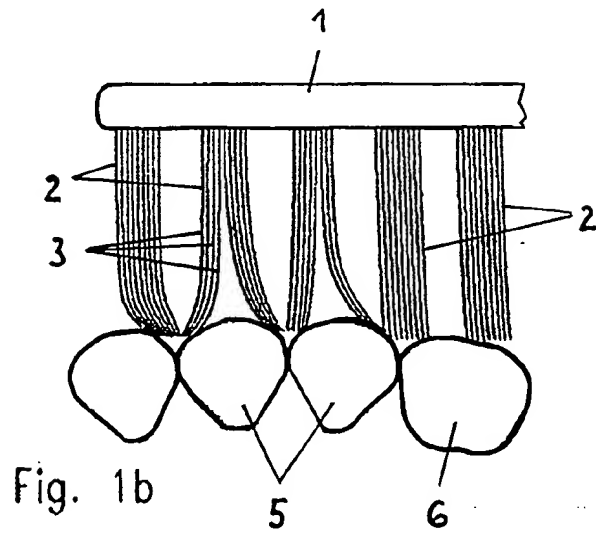
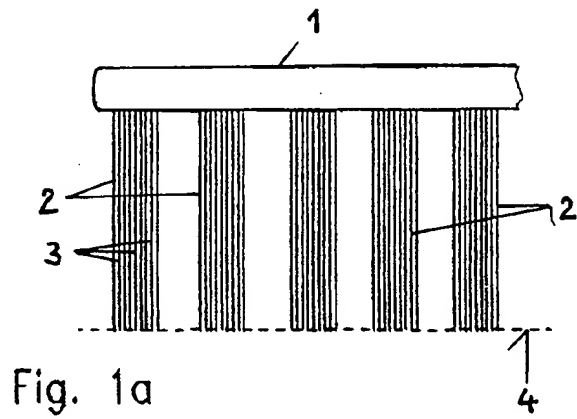
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ABSTRACT

A brush for tooth and personal hygiene comprises a bristle carrier and bristle bundles fixed thereto, the ends of the bristles being located in at least two different planes perpendicular to the bristle extension. The cleaning action is improved in that over a bristle carrier surface of max 6 mm<sup>2</sup> are provided at least two bristle bundles and that either the ends of the bristles of a single bundle or the ends of the bristles of adjacent bundles are located in at least two different planes.



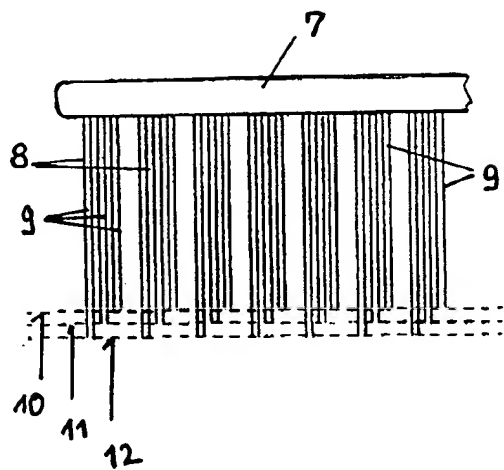


Fig. 2a

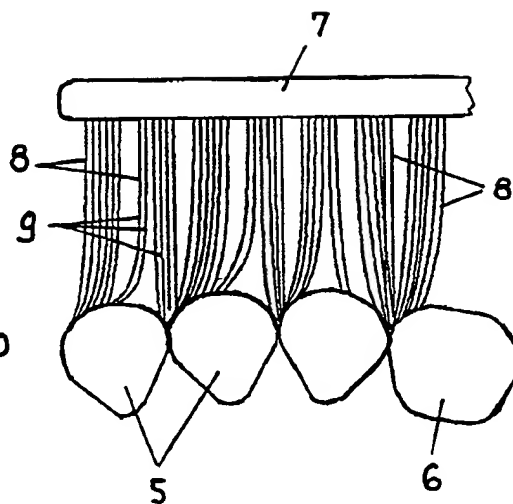


Fig. 2b

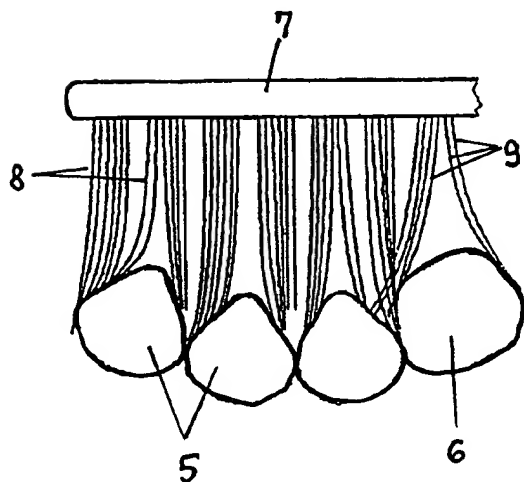


Fig. 2c

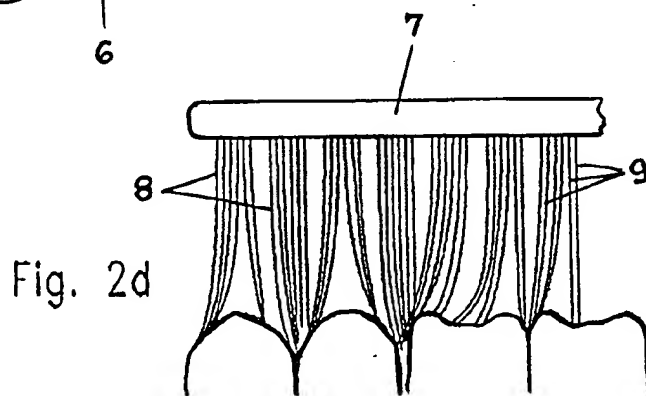
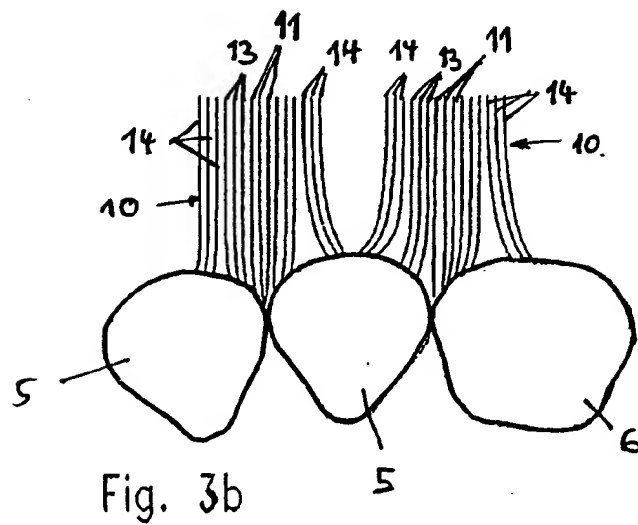
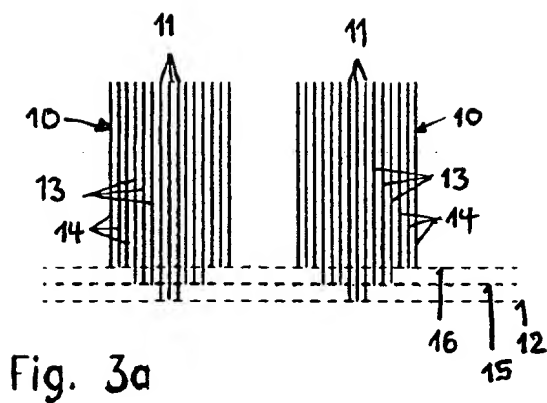
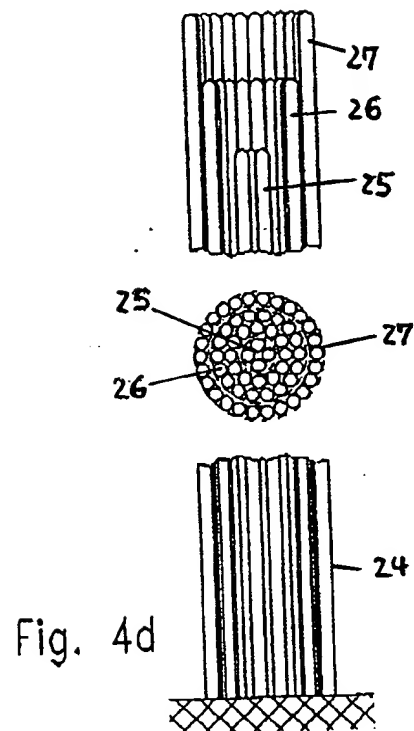
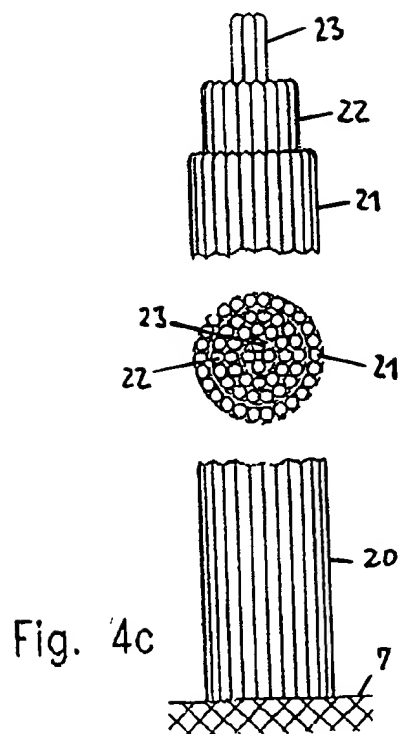
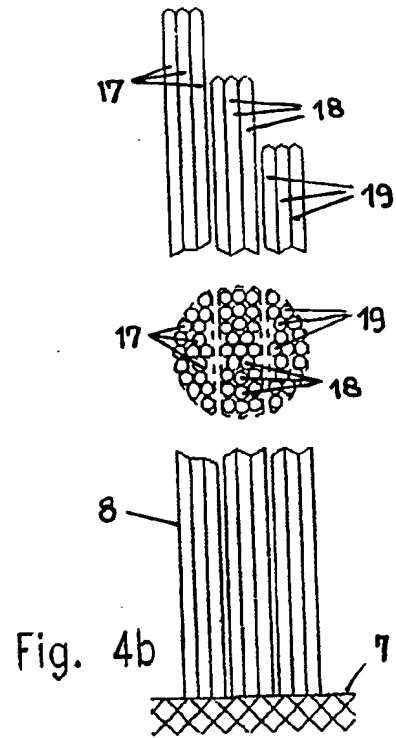
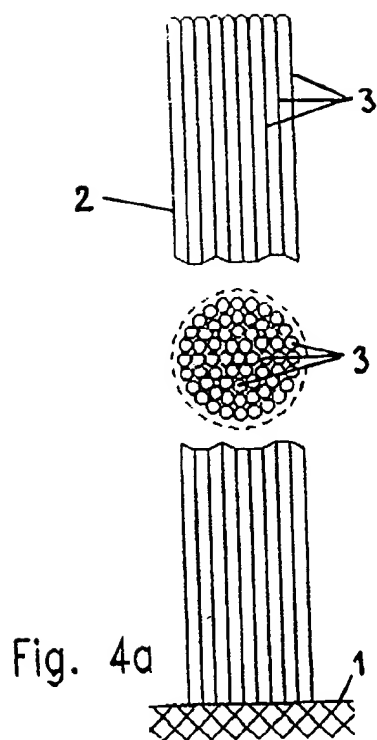
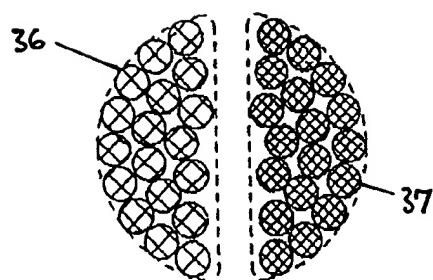
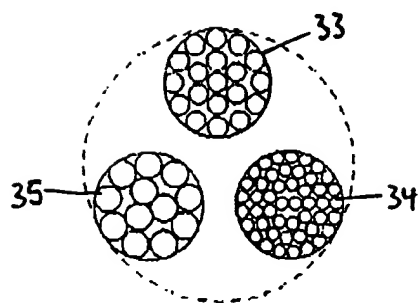
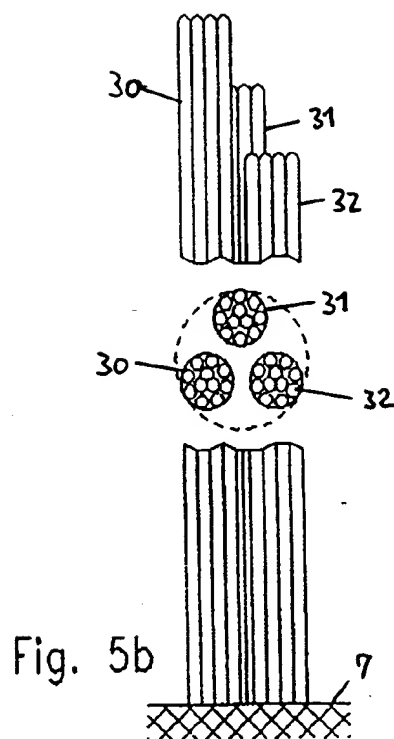
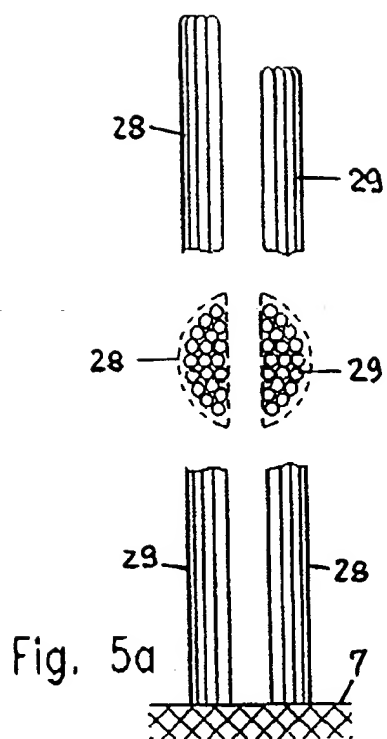


Fig. 2d







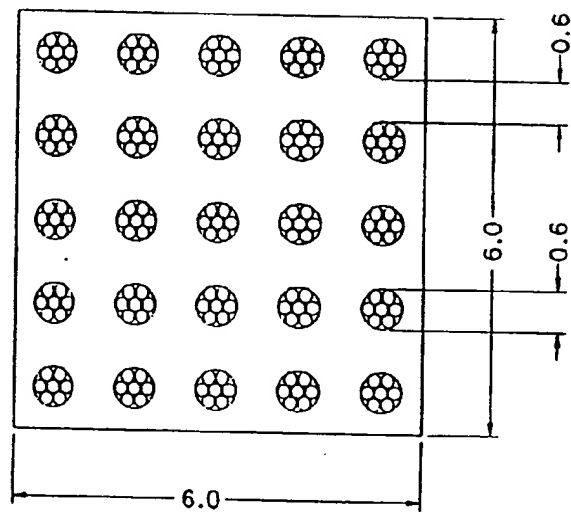


Fig.7



PERSONAL HYGIENE AND TOOTH BRUSHFIELD OF THE INVENTION

The invention relates to a brush for tooth and personal hygiene comprising a bristle carrier and bristle bundles fixed thereto, the ends of the bristles being located in at least two different planes perpendicular to the bristle extension.

BACKGROUND OF THE INVENTION

Numerous factors are decisive for the effectiveness of toothbrushes. They range from purely geometrical dimensions, such as the bristle diameter, bristle length and area of the bristle field, through bristle density, bristle material and strength characteristics, such as the bending capacity and recovery capacity, up to the arrangement of the bristles within the bristle facing or setting.

It has already been recognized that an exclusively planar working surface, i.e. a planar envelope surrounding the bristle ends leads to an inadequate cleaning, particularly in the interdental spaces, because during the cleaning movement the bristles are bent round substantially in the same direction, namely counter to the movement direction and do not adequately penetrate the interdental spaces. Similar problem areas are the dental necks in the transition to the gingiva. It is also problematical that the denture is concavely curved on the tooth outside in the front tooth area, but convexly curved on the inside, so that in particular the cleaning of the inside of front teeth can scarcely be effective.

The individual tooth also has on the inside and outside different curvatures and finally in the back tooth area the masticatory surface has a different configuration to the inside or outside of the tooth. The inadequate cleaning action of the aforementioned toothbrushes with a planar working surface and dense bristle setting is essentially due to the mutual supporting of the bristles with the consequence of the bristles being deflected counter to the movement direction and the inadequate adaptation of the working surface to the different denture or tooth contours.

Bristle bundles have been given a different length and/or different angular position with the aim of obviating this problem. It is therefore known (US 4 010 509) to make the bristle bundles located in the central longitudinal extension of the bristle carrier shorter than the bundles on either side in the marginal area and which also have an angular setting. With respect to the deflection of the bristles the same applies with respect to the individual bundles as in the previously described toothbrush. The bundles having the same length once again are deflected in a single direction, namely in opposition to the movement direction.

Much the same applies for another known toothbrush (US 3 722 020), in which the ends of the bristle bundles are located in three working planes, whose level rises to the outside from the median longitudinal axis. The aim is to obtain a substantially convex action surface, which is possibly favourable for the outside of the tooth in the front tooth area.

In another known construction (US 4 979 782) the bristles of each bundle are of different length and form a concave or convex action surface and the bundles can mutually have two different lengths, in that in the front area of the brush they are longer than in the rear area. It is also known (EP 449 655) to arrange bristle bundles with different bundle diameters and different length in groups, the action surfaces of the bristle ends being in two different planes, which are substantially perpendicular to the longitudinal extension of the bristle carrier. The shorter bundles can necessarily only act in one movement direction, if they are located in the movement direction upstream of the longer bundles. The bent round, longer bundles engage over them in the opposite direction and consequently render them ineffective.

It is finally known to place bristles of different length within a bundle (EP 473 312). However, this measure is provided in order to have thickenings at the bristle ends without the bundles expanding, which would necessarily be the case if the thickenings were located in one plane. Here again the bristles are supported against one another via the thickenings and consequently the entire bundle is deflected during cleaning.

As a result of the extremely high density of the bristles required in tooth-

brushes and accompanied by the minimum diameter for the same, for all the known constructions within the individual bundle the mutual supporting of the bristles prevents an adequate individual giving way during cleaning.

This is not altered by the various brushing methods recommended by dentists, e.g. from red (gingiva) to white (tooth) or the oscillation occurring with mechanically driven toothbrushes. In fact, in dental research attachment losses (gingival adhesion losses) and also damage to the actual tooth have been observed, which can be attributed to excessively strong brushing pressure. Such a high brushing pressure necessarily occurs if the user attempts to exert a brushing action on difficultly accessible areas.

In the case of a brush with the first-mentioned construction, the problem of the invention is to propose an arrangement, which permits an optimum adaptation of the action surfaces of the bristle bundles to the given denture and tooth contours, independently of the brushing technique used.

#### SUMMARY OF THE INVENTION

According to the invention this problem is solved in that there are at least two bristle bundles over a bristle carrier surface of  $\max 6 \text{ mm}^2$  and that either the ends of the bristles of an individual bundle or the ends of the bristles of adjacent bundles are located in at least two different planes.

As a result of the arrangement of at least two bristle bundles on a surface area of  $\max 6 \text{ mm}^2$ , the possibility is created of minimizing the action surfaces resulting from the ends of each bristle bundle. The total working surface of the bristle setting is consequently subdivided into minimum surface elements, but with at the same time a dense arrangement thereof. As a result of further measures provided by the invention, namely either having the ends of the bristles of a single bundle or the ends of the bristles of adjacent bundles in at least two different planes, allows the subdivision of the contouring of the working surface into very small action surfaces with different levels, so that they have a different penetration depth on the denture contour and the mutual supporting of the bristles is reduced, so that given curvatures can be better adapted or longer bristles more easily give way and the shorter

bristles have a better action.

In a preferred embodiment the ends of the bristles of a single bundle or the ends of the bristles of three adjacent bundles are located in three different planes.

The ends of the bristles of one bundle can be located on concentric planes and instead of this the planes of the same level of several bundles can extend along or transversely to the bristle carrier. The orientation of these planes in the longitudinal extension of the bristle carrier can vary.

According to another preferred embodiment the bristles, whose ends are located in the same plane, have a mutually identical diameter, but which is different from that of the bristles whose ends are located in another plane. In this way the stiffness of the bristles, whose ends are located in a common action surface can be made different from that of the bristles, whose ends are located in another plane.

Finally, the bristles, whose ends are located in one plane, can have different characteristics, e.g. material, surface, colour, etc. from the bristles, whose ends are located in another plane.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in greater detail hereinafter relative to non-limitative embodiments and the attached drawings, wherein show:

- Fig. 1a      A diagrammatic, broken away view of a conventional toothbrush in the starting position.
- Fig. 1b      The toothbrush of fig. 1a in the use position.
- Fig. 2a      A view corresponding to fig. 1a of a first embodiment of the invention.
- Fig. 2b      The embodiment of fig. 2a in the use position when cleaning the denture outside.

- Fig. 2c      The embodiment of fig. 2a when cleaning the denture inside.
- Fig. 2d      The embodiment of fig. 2a when cleaning the masticatory surfaces.
- Fig. 3a      A diagrammatic view of a second embodiment in the starting position.
- Fig. 3b      The embodiment of fig. 3a in a use position.
- Fig. 4a      An individual, conventional bristle bundle.
- Fig. 4b      A first embodiment of a bundle with stepped bristles.
- Fig. 4c      A second embodiment of a bundle with stepped bristles.
- Fig. 4d      A third embodiment of a bundle with stepped bristles.
- Fig. 5a      Two adjacent bristle bundles with stepped working surface.
- Fig. 5b      Three adjacent bristle bundles with stepped working surface.
- Fig. 6a      An embodiment corresponding to fig. 5b with different bristles.
- Fig. 6b      An embodiment corresponding to fig. 5a with different bristles.
- Fig. 7      The geometrical dimension of a partial area of the bristle setting of a toothbrush.

#### DETAILED DESCRIPTION OF THE DRAWINGS

Reference will firstly be made to fig. 7, which shows a detail of a bristle carrier with bristle setting. On a surface area of  $6 \text{ cm}^2$  are located 25 bristle bundles with a diameter of in each case  $0.6 \text{ mm}$ , the bundles having a mutual spacing of  $0.6 \text{ mm}$ , so that there are four bundles over roughly  $6 \text{ mm}^2$ . Such an arrangement can be implemented in the optimization of the most modern manufacturing technologies.

Fig. 1a shows a detail of a toothbrush, manufactured using this technology, with conventional bristle or bundle arrangement. It comprises a bristle carrier 1 and bundles 2, which are in each case formed from several bristles 3. The bristle bundles 2 have the same length, so that their ends are on a planar envelope forming the working surface 4.

Fig. 1b diagrammatically shows a denture in the front tooth area with the front teeth 5 and the first back tooth 6 connecting on to the front tooth area. When carrying out the cleaning movement the bristle bundles 2 at their ends are bent round counter to the movement direction, as can be seen in the bristle bundle 2 furthest to the left. Intermediately the bristle bundles expand, but without their ends having any significant action, whereas the bristle bundles 2 further to the right have no action at all. It can in particular be seen that the bristles do not or only inadequately penetrate the interdental spaces.

Fig. 2a shows a toothbrush according to the invention, in which once again bristle bundles 8 are fixed to the bristle carrier 7 in the arrangement shown in fig. 7. The bristles 9 of each bundle 8 or groups of bristles are of varying length, so that in the embodiment shown their ends are in three stepped action planes 10, 11 and 12.

In fig. 2b the toothbrush of fig. 2a is shown in one of the standard use positions on the outside of the denture when cleaning teeth. It is once again possible to see the front teeth 5 and the first back tooth 6. When the bristles are pressed they give way in a much more varied manner under the cleaning movement, as is apparent from a comparison of figs. 1b and 2b. Whereas the bristle bundles to the left are bent away entirely in one direction (counter to the movement direction), but as a result of the stepped action surfaces of the individual bristles of the bundle engage on the outer contour of the tooth, in the case of the other bundles the bristles of each bundle give way in different directions and consequently once again partially perfectly penetrate the interdental spaces, whereas other bristles of the same bundle or the bristles of the adjacent bundle act on the tooth faces. The same applies when cleaning the inside of teeth, as can be seen in fig. 2c. The bristles are adapted in optimum manner to the contour of the faces to be

cleaned, including the interdental spaces. As is shown in fig. 2d, the same optimum adaptation occurs at the masticatory surfaces.

In the embodiment of fig. 3a each bundle 10 has central bristles 11, whose ends are located on one action surface and on both sides of the bristles 11 there are groups of bristles 12 and 13, whose ends are once again located in two different action surfaces 15, 16. The action of such a construction can be gathered from fig. 3b.

Fig. 4a shows a single bristle bundle 2 corresponding to the embodiment of fig. 1a. The bristles 3 of such a bundle 2, which essentially have the indicated circular shape, have the same length.

Fig. 4b shows a single bristle bundle 8 corresponding to the embodiment of fig. 2a to d. The ends of the bristles of such a bundle 8 are stepped in three planes transversely to the bundle extension. Alongside a segment with maximum length bundles 17, there is a segment with medium length bundles 18 and alongside the same a segment with minimum length bundles 19. Fig. 4c shows a circular stepping of the action faces of the bristles of a bundle 20, namely with an outer group of minimum length bristles 21, a central group of medium length bristles 22 and an inner group with maximum length bristles 23.

In the embodiment according to fig. 4d the reverse arrangement is provided on a bristle bundle 24, which consequently has a central group of minimum length bristles 25, a group of medium length bristles 26 concentrically surrounding it and an outer group of maximum length bristles 27.

Instead of the stepping of the action faces of an individual bundle, in an arrangement according to fig. 7 the action face of adjacent bundles can be at different levels. Thus, fig. 5a shows two adjacent bundles 28, 29, whose cross-section is circular segmental, the bristles of the bundle 28 having a greater length than those of the bundle 29. In the embodiment according to fig. 5b there are three cross-sectionally circular bundles in the arrangement according to fig. 7 with varying lengths, the bundle 30 having the longest bristles, the bundle 31 medium length bristles and the bundle 32 the shortest bristles.

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- 8 -

As shown in fig. 6a, a further design possibility is brought about in that the bristles of adjacent bundles 33, 34, 35 have different diameters or, as indicated in fig. 6b, the bristles of adjacent bundles 36, 37 have different characteristics, e.g. are made from different materials or have different surface characteristics.



CLAIMS

1. Brush for tooth and personal hygiene comprising a bristle carrier and bristle bundles fixed thereto, the ends of the bristles being located in at least two different planes perpendicular to the bristle extension, characterized in that over a bristle carrier surface of max 6 mm<sup>2</sup> are provided at least two bristle bundles (8) and that either the ends of the bristles (9) of a single bundle (8) or the ends of the bristles of adjacent bundles (28, 29) are located in at least two different planes (10, 11, 12).
2. Brush according to claim 1, characterized in that the ends of the bristles (9) of a single bundle (8) or the ends of the bristles of three adjacent bundles (33, 34, 35) are located in three different planes (10, 11, 12).
3. Brush according to claim 1 or 2, characterized in that the ends of the bristles (21, 22, 23) of a bundle (20) are located on concentric planes.
4. Brush according to one of the claims 1 to 3, characterized in that the planes (10, 11, 12) of several bundles (8) with the same level can extend along or transversely to the bristle carrier.
5. Brush according to one of the claims 1 to 4, characterized in that the bristles, whose ends are located in the same plane, have a mutually identical diameter, but which differs from that of the bristles whose ends are located in another plane.
6. Brush according to one of the claims 1 to 5, characterized in that the bristles, whose ends are located in the same plane, have identical characteristics, e.g. material, surface, colour, etc., but which differ from those of bristles, whose ends are located in another plane.